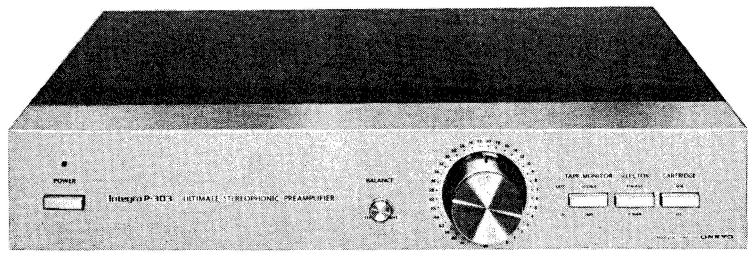
SERIAL **NO. 3035**

ONKYO® SERVICE MANUAL

ULTIMATE STEREOPHONIC PREAMPLIFIER Model P-303



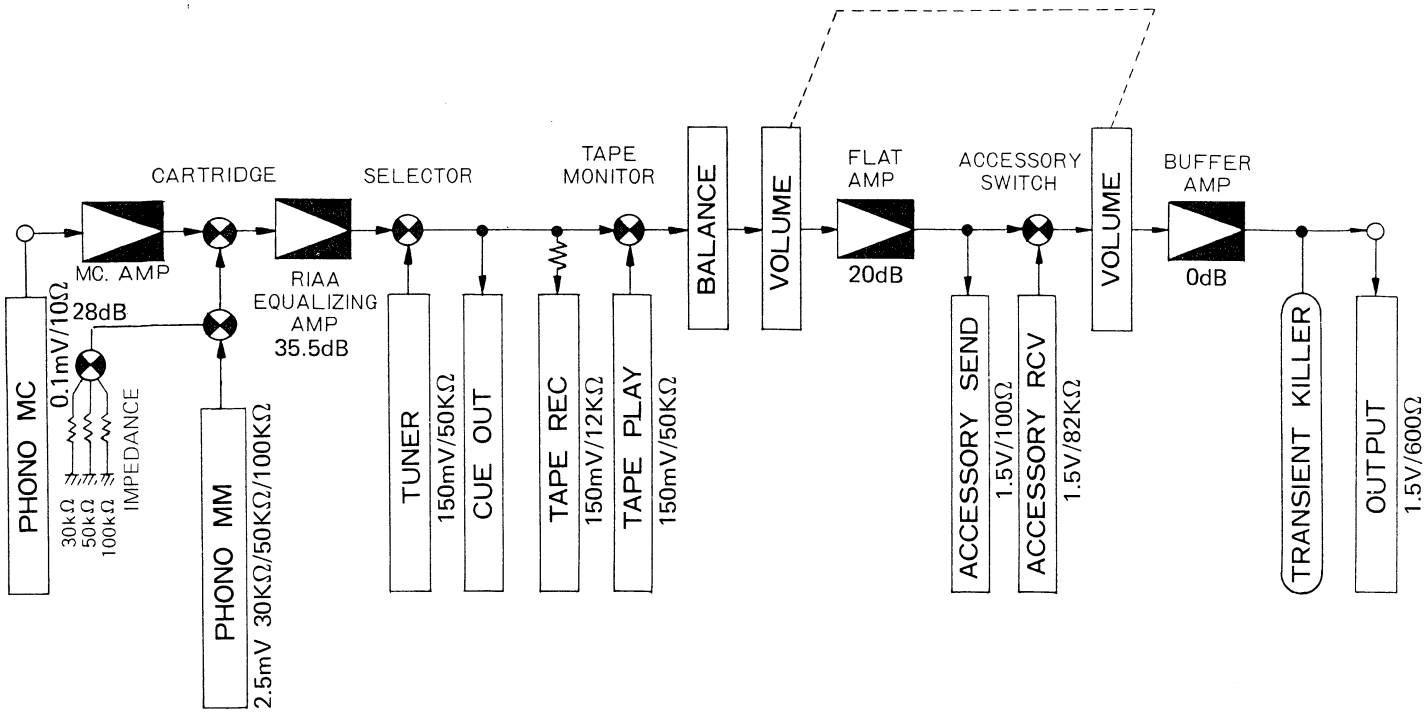
SPECIFICATIONS

Input Sensitivity and Impedance	PHONO MC: 100μV/10 Ω PHONO MM: 2.5 mV/30 kΩ, 50 kΩ, 100 kΩ (Switchable) TUNER: 150 mV/50 kΩ TAPE PLAY: 150 mV/50 kΩ ACCESSORY RCV: 1.5 V/82 kΩ
Rated Output and Impedance	TAPE REC: 150 mV/4 kΩ (PHONO) ACCESSORY SEND: 1.5 V/100 Ω OUTPUT: 1.5 V/600 Ω Max. 15 V
RIAA Deviation	±0.2 dB, 20–20,000 Hz
Frequency Response (TUNER)	+0, −1.5 dB, 3.5 Hz–200 kHz
Phono Overload	PHONO MM: 330 mV RMS at 1 kHz, THD. 0.05 % 1600 mV RMS at 10 kHz, THD. 0.05 % PHONO MC: 13 mV RMS at 1 kHz, THD. 0.05 % 63 mV RMS at 10 kHz, THD. 0.05 %
Total Harmonic Distortion	0.006 % at PHONO MM, 3 V output 0.03 % at PHONO MC, 3 V output
Intermodulation Distortion	0.01 % (70 Hz: 7 kHz = 4:1)
Signal-to-Noise Ratio	PHONO MC: 70 dB (IHF A NETWORK) PHONO MM: 83 dB (IHF A NETWORK) TUNER: 100 dB(IHF A NETWORK)
Rated Output Voltage	1.5V
Power Supply Rating	AC 120 V 60 Hz or AC 220V 50 Hz
Inputs	PHONO MC PHONO MM TUNER TAPE PLAY ACCESSORY RCV
Outputs	TAPE REC OUT, CUE OUT OUTPUT ACCESSORY SEND AC OUTLET SWITCHED x 3, UNSWITCHED x 1
Semiconductors	52 Transistors, 29 Diodes
Dimensions (m m)	450W (17-3/4") x 83H (3-1/4") x 370D (14-9/16")
Weight	7.5 kg. (16.5 lbs.)

Specifications are subject to change without notice.

ONKYO®
AUDIO COMPONENTS

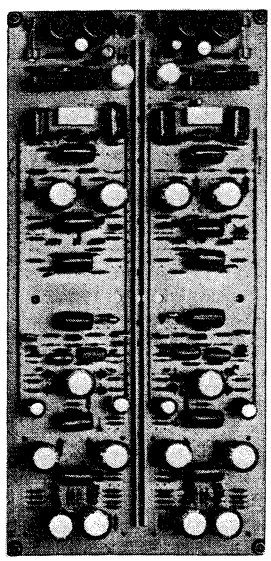
BLOCK DIAGRAM



CIRCUIT DESCRIPTION

1. General Circuitry

A basic condition for any good quality audio amplifier is "to amplify audio signals without causing any change, or 'coloration', in the original program source whatsoever. To achieve this goal, the model P–303 preamplifier employs only high grade circuits and high performance circuit components throughout, and limits the signal path to the shortest route possible.



BUFFER AMPLIFIER

FLAT AMPLIFIER

EQUARIZER AMPLIFIER

MC AMPLIFIER

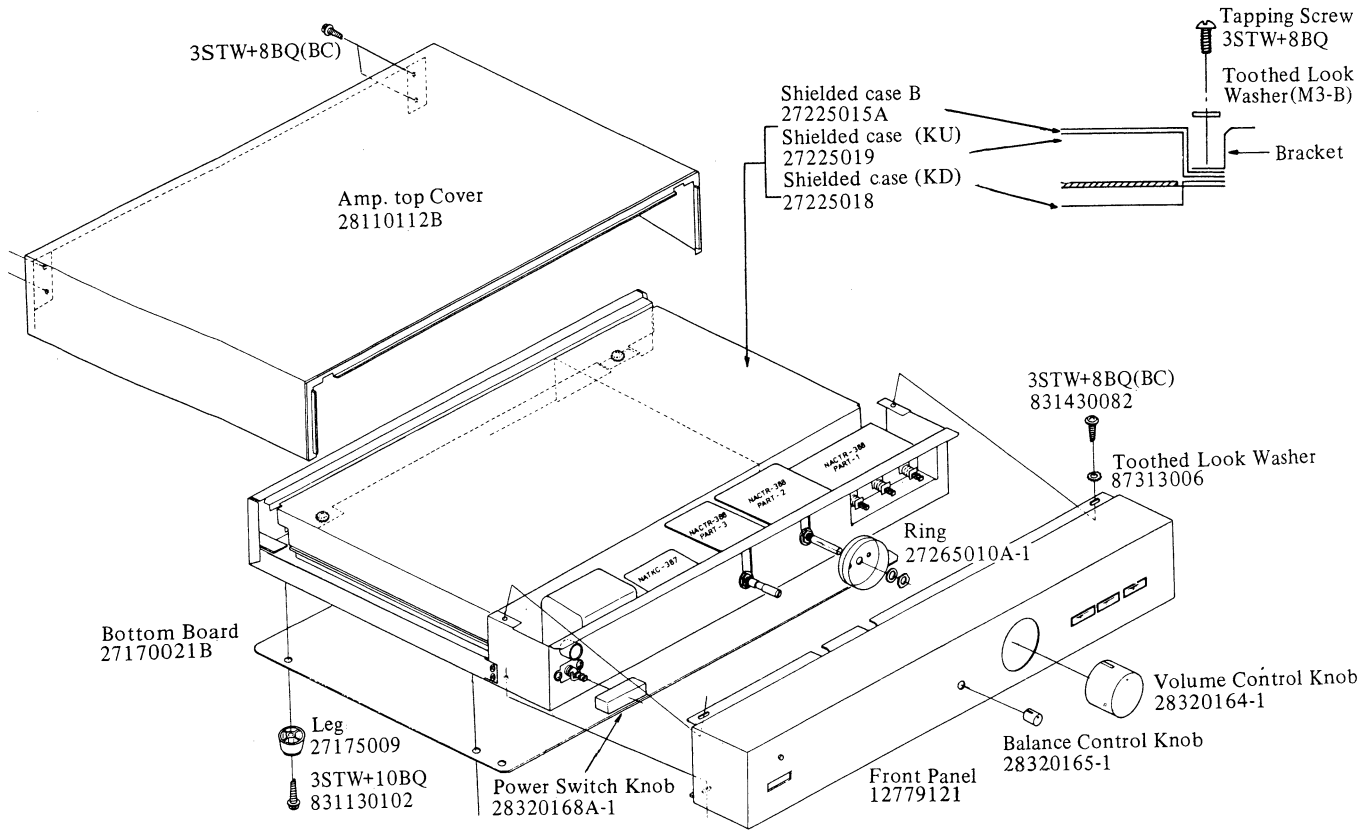
Right Channel Left Channel

The bird's eye view (photograph) of the model P–303 shows the completely independent left and right channels, with their respective + and – stabilized voltage power supplies. Besides the bus bar ground conductor, which has also been employed in other Onkyo amplifiers, both left and right channels are also equipped with separate power bus lines (bus bar power supply lines) for direct supply of power to all individual circuits. The constant voltage power supply in both channels is also further stabilized by the incorporation of a second stabilizer circuit.

The MC amplifiers (lower part of photograph) are designed for direct connection to MC cartridge tonearms without the need for extra step–up transformers.

The faint input signals from MC cartridges are amplified up to a level high enough for the equalizer amplifier to handle, but importance has also been placed upon the reduction of noise (i.e. high S/N ratio). This is because the output level from most MC cartridges in use today are extremely small, ranging on the whole from 0.05mV to 0.3mV. Consequently, the reduction of noise achieved in the P–303 has been very considerable indeed. Employing a total of 6 transistors in a triple push–pull circuit, S/N ratio has been improved to 70dB (equivalent input of 150dB/V). With an input impedance of 10 ohms, cartridges of specified cartridge load from 2 to 40 ohms may be used. And in order to reduce the effects of induced noise, and noise caused by external sources, very strict

EXPLODED VIEW

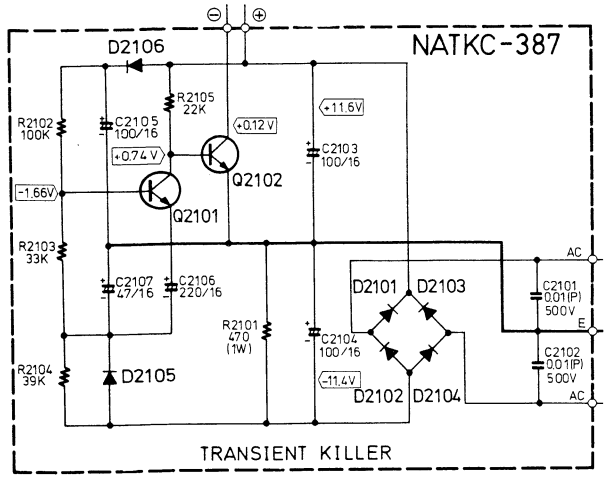


SERVICE POINTS

1. When the CARTRIDGE switch is in the MC position, the circuitry becomes very sensitive, and tends to pick up induction hum rather readily. Although the MC amplifier circuit has been heavily shielded, keep the power transformer of other quipment at a respectable distance.
2. The ACCESSORY and CUE OUT terminals on the rear panel are for use with other optional equipment, so leave them disconnected during servicing. Furthermore, the ACCESSORY terminal switch must be turned OFF when no other equipment is connected. Otherwise, no sound will be obtained.

attention has been given to minimizing the amount of wiring, and to the shielding of sensitive circuits. Furthermore, gold plating of the pin jacks serves to reduce contact resistance and ground currents.
The equalizer circuit features a 3–stage complementary push–pull arrangement including an input differential push–pull. RIAA deviation is suppressed by the use of high grade circuit elements of class G tolerance (2%) in the RIAA equalization circuit.
The flat amplifier employs an input differential 2–stage complementary circuit with a dual transistor package in the differential stage. The gain obtained by the flat amplifier is 20dB, while the volume control is linked to both before and after the flat amplifier, considerably reducing the amount of residual noise when the control is turned right down. The 20dB improvement obtained in reference to maximum volume level.
The buffer amplifier consists of a cascade push–pull, while a recently developed transient killer circuit, employing a break relay, has been inserted in the output.

2. Transient Killer Circuit



When the power supply switch is turned ON, C2105 is charged up immediately. But because of R2101 and the related time constants, C2106 and C2107 charge up relatively slowly. Consequently, the base of Q2101 will initially become positive, but because of the forward bias applied to this transistor, it is turned ON. Then because of the voltage drop across R2105, the bias on Q2102 becomes O, thus turning Q2102 OFF. Since the relay employed in the P–303 is of the break contact type, the output circuit remains connected to ground, thus preventing the appearnce of an output signal.
While C2106 and C2107 continue to charge up, the base of Q2101 gradually becomes minus, thus turning Q2101 OFF (approximately 8 seconds later). Q2102 is subsequently turned ON because of the forward direction biasing, and the relay contact is thus released, resulting in the appearance of signals at the output terminals.
When the power supply is turned OFF again, –B is immediately discharged through R2101, while the charge on C2106 and C2107 is discharged through D2105. The bias of Q2101 thus becomes positive, resulting in this transistor turning ON, and Q2102 turning OFF. The relay contact thus closes, shorting the signal circuit to ground, and preventing the appearance of any further signals at the output terminals.

PARTS LIST

120V Model

CIRCUIT NO.	PART NO.	DESCRIPTION
U1	12850585	NAAF-385
U2	12850587	NATKC-387
U3	12850588	NAC TR-388
PL0001	210015A	50mA 6.3V, Power Indicator light
T0001	230202	NPT-628D, Power Transformer
C0001	3504012	0.01μF125V, UL Capacitor
C0009, C0010	374124737	0.047μF±20% 50V, DE Capacitor
S0001	25035015	NPS-111LA3, Power Switch
S0003	25065027	NSS-4329, Phono Impedance Selector Switch
S0005	25065028	NSS-4230, Accessory Selector Switch
P0001	25045035	NPJ-2PRBL12, Phono Input Terminals
P0002	25045035	NPJ-2PRBL12, Phono(MC) Input Terminals
P0003	25045035	NPJ-2PRBL12, Tuner Input Terminals
P0004	25045035	NPJ-2PRBL12, Tape Input Terminals
P0005	25045035	NPJ-2PRBL12, Tape Output Terminals
P0006	25045035	NPJ-2PRBL12, Cue Output Terminals
P0007	25045035	NPJ-2PRBL12, Send Terminals
P0008	25045035	NPJ-2PRBL12, Recieve Terminals
P0009	25045035	NPJ-2PRBL12, Output Terminals
P0010	25050008A	S-I6432, Unswitched, AC Outlet
P0011-P0013	25050008A	S-I6432, Switched, AC Outlet
P0014	270665	GND Terminal
	253091	AS-UC-2, Power Supply Cord
	270280	SR-4K-4, Strainrelief
F0001	252001	1A-T, AC Fuse
F0001a	250143	FF-1S4, Fuseholder for AC Fuse
	270611	Cover for PL0001
A005	27225015A	Shielded Case B
A007	27150061	Shielded Plate
A020	27120087	Back Panel
A022	270373-1	Stopper for S0005
A023	27225019	Shielded Case KU
A024	27225018	Shielded Case KD
A301	28110112B	Top Cover Ass'y
A301e	27150062A	Shielded Plate K for A301
A501	12779121	Front Panel Ass'y
A502	28125037-1	End Cap, Left
A503	28125038-1	End Cap, Right
A504	27267018	Power Switch Guide
A505	27267017A	Push Switch Guide
A506	28198505	Facet for PL0001
A507	27265010A-1	Ring
A801	28320164-1	Volume Knob
A802	28320165-1	Balance Knob
A803	28320168A-1	Power Knob
A804	28320167A-1	Push Knob
A805	27180021	Spring for A804
A806	28330017	Cap for A804
A631	27170021B	Bottom Board
A632	27175009	Leg

220V Model

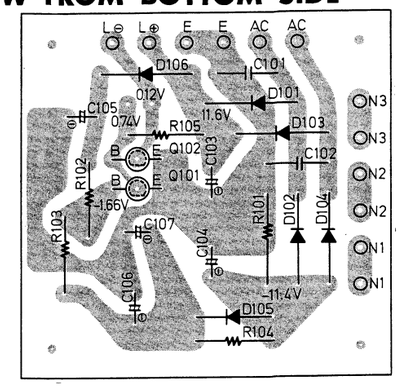
CIRCUIT NO.	PARTS NO.	DESCRIPTION
U1	12850585	NAAF-385
U2	12850587	NATKC-387
U3	12850588	NACTR-388
PL0001	210015A	50mA 6.3V, Power Indicator light
T0001	230203	NPT-628G, Power Transformer
C0001	3500052	PME271Y510CEE, IS Capacitor
C0009, C0010	374124737	0.047μF±20% 50V, DE Capacitor
S0001	25035015	NPS-111LA3, Power Switch
S0003	25065027	NSS-4329, Phono Impedance selector Switch
S0005	25065028	NSS-4230, Accessory Selector Switch
P0001	25045035	NPJ-2PRBL12, Phono Input Terminals
P0002	25045035	NPJ-2PRBL12, Phono(MC) Input Terminals
P0003	25045035	NPJ-2PRBL12, Tuner Input Terminals
P0004	25045035	NPJ-2PRBL12, Tape Input Terminals
P0005	25045035	NPJ-2PRBL12, Tape Output Terminals
P0006	25045035	NPJ-2PRBL12, Cue Output Terminals
P0007	25045035	NPJ-2PRBL12, Send Terminals
P0008	25045035	NPJ-2PRBL12, Recieve Terminals
P0009	25045035	NPJ-2PRBL12, Output Terminals
P0010	25050008A	S-I6432, Unswitched AC Outlet
P0011-P0013	25050008A	S-I6432, Switched AC Outlet
P0014	270665	GND Terminal
	253091	AS-UC-2, Power Supply Cord
	270280	SR-4K-4, Strainrelief
F0001	252023	0.5A-T, AC Fuse
	282987	Fuse Label
F0001a	250143	FF-1S4, Fuseholder for AC Fuse
	270611	Cover for PL0001
A005	27225015A	Shielded Case B
A007	27150061	Shielded Plate
A020	27120088	Back Panel
A022	270373-1	Stopper for S0005
A023	27225019	Shielded Case KU
A024	27225018	Shielded Case KD
A301	28110112B	Top Cover Ass'y
A301e	27150062A	Shielded Plate K for A301
A501	12779121	Front Panel Ass'y
A502	28125037-1	End Cap, Left
A503	28125038-1	End Cap, Right
A504	27267018	Power Switch Guide
A505	27267017A	Push Switch Guide
A506	28198505	Facet for PL0001
A507	27265010A-1	Ring
A801	28320164-1	Volume Knob
A802	28320165-1	Balance Knob
A803	28320168A-1	Power Knob
A804	28320167A-1	Push Knob
A805	27180021	Spring for A804
A806	28330017	Cap for A804
A631	27170021B	Bottom Board
A632	27175009	Leg

HEAD, EQUARIZER/PRE AMPLIFIER PC BOARD (NAAF-385) – PARTS LIST

CIRCUIT NO.	PARTS NO.	DESCRIPTION
	NAAF-385 PART-1	
	Transistors	
Q101-Q112	2210665	2SA841(GR)
Q141-Q144	2210675	2SC1681(GR)
Q145-Q148	2210665	2SA841(GR)
Q149, Q150	2211206, 2211207, 2211085 2211084 or	2SA847-13A(F), 2SA847-13A(G) 2SA872A(E) 2SA872A(D) or
Q151, Q152	2211216, 2211217, 2210755 2210754 or	2SC1708-13A(F), 2SC1708-13A(G), 2SC1775A(E) 2SC1775A(D) or
Q153, Q154	2200364 2200365 or	2SD358(D) 2SD358(E) or
Q155, Q156	2200354 2200355 or	2SB528(D) 2SB528(E) or

CIRCUIT NO.	PARTS NO.	DESCRIPTION
	Diodes	
D141-D148	223105	1S1555
	Capacitors	
C101-C104	390884717	470μF 50V, SLD
C105, C106	374121057	1μF±20% 50V, DE
C107, C108	374124725	4,700PF±10% 50V, DE
C111, C112	390831027	1,000μF 50V, SLD
C115, C116		
C117-C124	374124737	0.047μF±20%, 50V, DE
C141, C142	374121057	1μF±20% 50V, DE
C145, C146	390881017	100μF 50V, SLD
C153, C154		
C161, C162	388125233	0.052μF±2% 50V, DT
C167, C168	388121833	0.018μF±2% 50V, DT
C177, C178	374121057	1μF±20% 50V, DE
C179, C180	372323915	390PF±10% 50V, ST
C189, C190	390884717	470μF 50V, SLD
C191, C192	374121035	0.01μF±10% 50V, DE
	Resistors	
R133, R134 R137, R138	441624724	4.7kΩ 1W, Metal Oxide Film
R177-R180	441524704	47Ω 1/2W, Metal Oxide Film
	NAAF-385 PART-2	
	Transistors	
Q201, Q202	2210700	2SC1583(0-001)
Q203, Q204	2211140	2SA798(0-001)
Q205, Q206	2211206, 2211207, 2211085 2211084 or	2SA847-13A(F), 2SA847-13A(G), 2SA872A(E) 2SA872A(D) or
Q207, Q208	2211216, 2211217, 2210755 2210754 or	2SC1708-13A(F), 2SC1708-13A(G), 2SC1775A(E) 2SC1775A(D) or
Q241, Q242	2211216, 2211217, 2210755 2210754 or	2SC1708-13A(F), 2SC1708-13A(G), 2SC1775A(E) 2SC1775A(D) or
Q243, Q244	2211206, 2211207, 2210755 2210754 or	2SA847-13A(F), 2SA847-13A(G), 2SA872A(E) 2SA872A(D) or
Q245, Q246	2210834	2SA850(D)
Q247, Q248	2210844	2SC1735(D)
Q261, Q262	2210863	2SC1212AWT(C)
Q263, Q264	2210853	2SA743A(C)
Q281	2200744	2SD526(Y)
Q282	2200413	2SB596(Y)
	Diodes	
D261-D264	224022	WZ-350, Zener
D281-D284	223829	1S1887
D285, D290	223105	1S1885
D286-D289	223916	WZ-240, Zener
	Capacitors	
C201, C202	374121057	1μF±20% 50V, DE
C219, C220		
C209, C210	374121525	1,500pF±10% 50V, DE
C213, C214		
C241, C242	374121057	1μF±20% 50V, DE
C245-C248		
C261, C262	352780101	1μF 50V, Elect.
C265, C266		
C263, C264	390884717	470μF 50V, Elect.
C267, C268		
C269,	352784791	0.47μF 50V, Elect.
C283-C286	3500044	470μF 80V, Elect.
C287, C288	352771011	100μF 63V, Elect.
C289, C290	352774701	47μF 63V, Elect.
C291, C292	352783311	330μF 50V, Elect.
	Resistors	
R247-R250	441625124	5.1kΩ 1W, Metal Oxide Film
R263, R264	441621514	150Ω 1W, Metal Oxide Film

TRANSIENT KILLER PC BOARD VIEW FROM BOTTOM SIDE



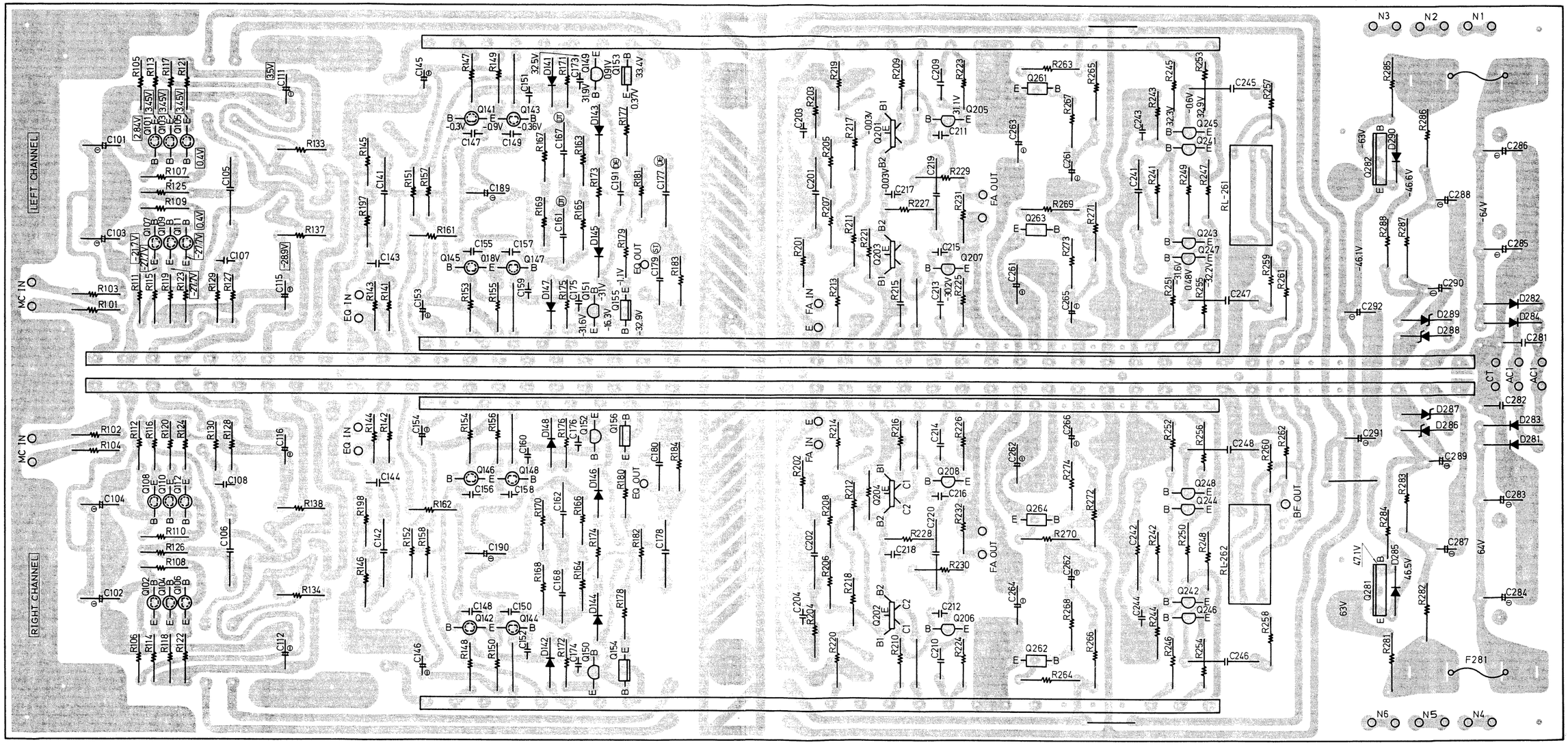
NATKC-387

CIRCUIT NO.	PARTS NO.	DESCRIPTION
R265, R266	441622724	2.7kΩ 1W, Metal Oxide Film
R269, R270	441621514	150Ω 1W, Metal Oxide Film
R271, R272	441622724	2.7kΩ 1W, Metal Oxide Film
R281, R285	451631004	10Ω 1W, Metal
R282, R286	441621524	1.5kΩ 1W, Metal Oxide Film
R283, R287	441621224	1.2kΩ 1W, Metal Oxide Film
	Relaies	
RL261, RL262	25065029	HA-112B
	Fuses	
F281, F282	252023	0.5A-T
	Fuseholders	
F281A, F282A	250113	S-N5051
	Radiators	
	27160021	RAD-06B P-2
	NATKC-387	
	Transistors	
Q101	2210743 2210085 or	2SC945Ⓛ(P) or 2SC733(GR)
Q102	2210085	2SC733(GR)
	Diodes	
D101-D104	223802	1S1885
D106		
D105	223105	1S1555
	Capacitors	
C103-C105	352741011	100μF 16V Elect.
C106	352742211	220μF 16V Elect.
C107	352744701	47μF 16V Elect.
	Resistor	
R101	441624714	470Ω 1W Metal Oxide Film
	NACTR-388	
	Variable Resistors	
R101-R104	5104044	N4ODQL32C
R105, R106	5172048	N24RGLC250KMN25
	Push Switches	
S101	25035045	NPS-162-L10
S102	25035045	NPS-162-L10
S103	25035046	NPS-162-L11

NOTES: When replacing diffrential amplifier or push-pull amplifier transistors, be sure that transistors of one channel have the same hFE ratings.

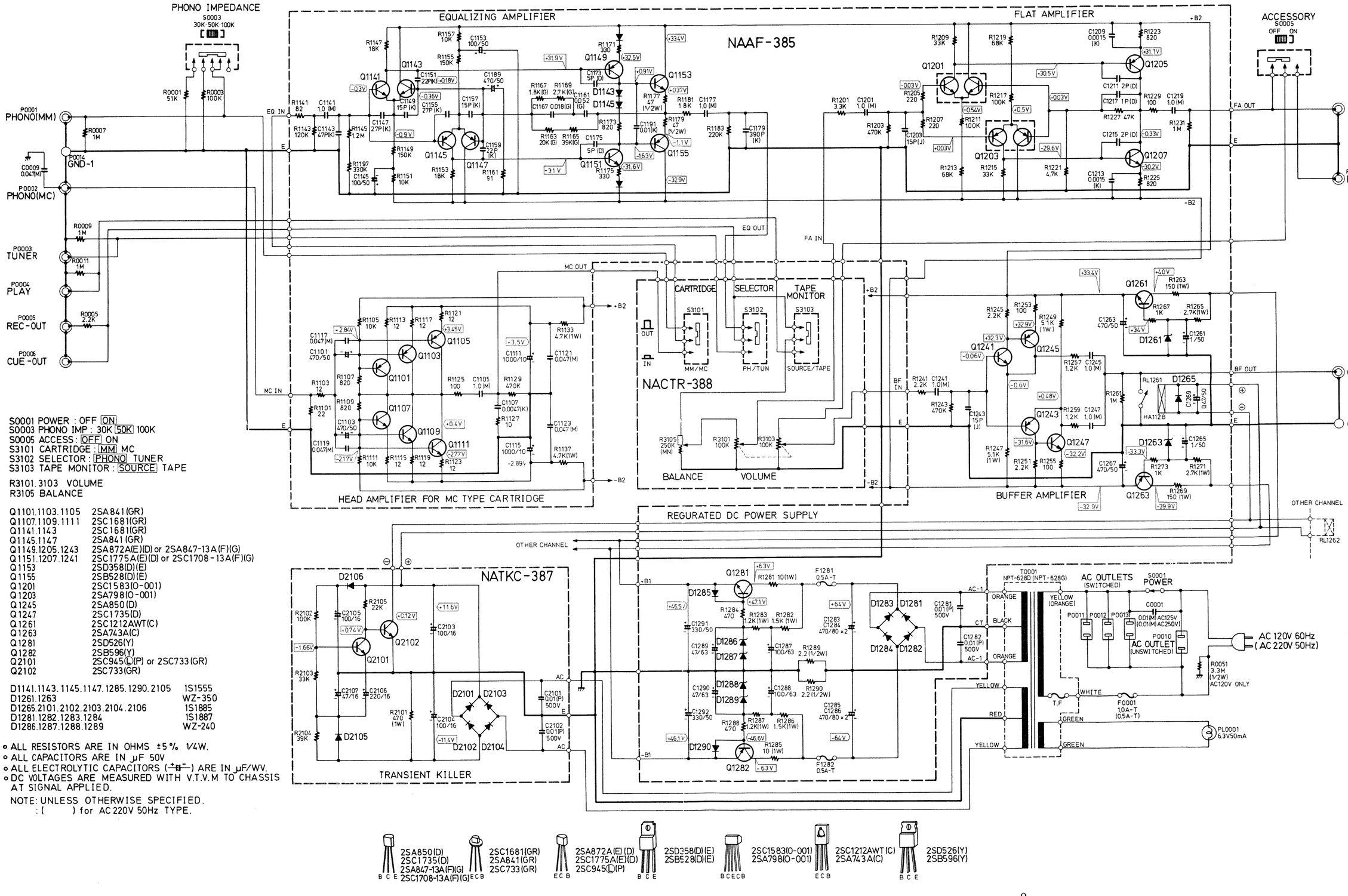
CAPACITORS: DE: Non-inductive polyester film capacitor
LD, SLD: Low leakage current type electrolytic capacitor
DT: Polypropylene film capacitor
ST: Polystyren film capacitor

HEAD EQUARIZER/PRE AMPLIFIER PC BOARD VIEW FROM BOTTOM SIDE



PART–1 PART–2 NAAF–385

MODEL P-303 SCHEMATIC DIAGRAM



S0001 POWER : OFF [ON]
S0003 PHONO IMP : 30K [50K] 100K
S0005 ACCESS : [OFF] ON
S3101 CARTRIDGE : [MM] MC
S3102 SELECTOR : [PHONO] TUNER
S3103 TAPE MONITOR : [SOURCE] TAPE

R3101.3103 VOLUME
R3105 BALANCE

Q1101.1103.1105	2SA841(GR)
Q1107.1109.1111	2SC1681(GR)
Q1141.1143	2SC1681(GR)
Q1145.1147	2SA841(GR)
Q1149.1205.1243	2SA872A(E)(D) or 2SA847-13A(F)(G)
Q1151.1207.1241	2SC1775A(E)(D) or 2SC1708-13A(F)(G)
Q1153	2SD358(D)(E)
Q1155	2SB528(D)(E)
Q1201	2SC1583(O-001)
Q1203	2SA798(O-001)
Q1245	2SA850(D)
Q1247	2SC1735(D)
Q1261	2SC1212AWT(C)
Q1263	2SA743A(C)
Q1281	2SD526(Y)
Q1282	2SB596(Y)
Q2101	2SC945Ⓛ(P) or 2SC733(GR)
Q2102	2SC733(GR)

D1141.1143.1145.1147.1285.1290.2105	1S1555
D1261.1263	WZ-350
D1265.2101.2102.2103.2104.2106	1S1885
D1281.1282.1283.1284	1S1887
D1286.1287.1288.1289	WZ-240

- ALL RESISTORS ARE IN OHMS ±5% 1/4W.
- ALL CAPACITORS ARE IN μF 50V
- ALL ELECTROLYTIC CAPACITORS (⁺⊞⁻) ARE IN μF/WV.
- DC VOLTAGES ARE MEASURED WITH V.T.V.M TO CHASSIS AT SIGNAL APPLIED.

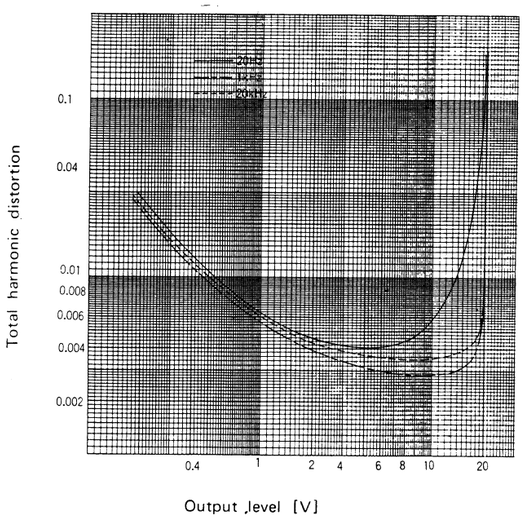
NOTE: UNLESS OTHERWISE SPECIFIED.
: ( ) for AC 220V 50Hz TYPE.

2SA850(D) 2SC1735(D) 2SA847-13A(F)(G) 2SC1708-13A(F)(G) B C E
2SC1681(GR) 2SA841(GR) 2SC733(GR) E C B
2SA872A(E)(D) 2SC1775A(E)(D) 2SC945Ⓛ(P) E C B
2SD358(D)(E) 2SB528(D)(E) B C E
2SC1583(O-001) 2SA798(O-001) B C E C
2SC1212AWT(C) 2SA743A(C) E C B
2SD526(Y) 2SB596(Y) B C E

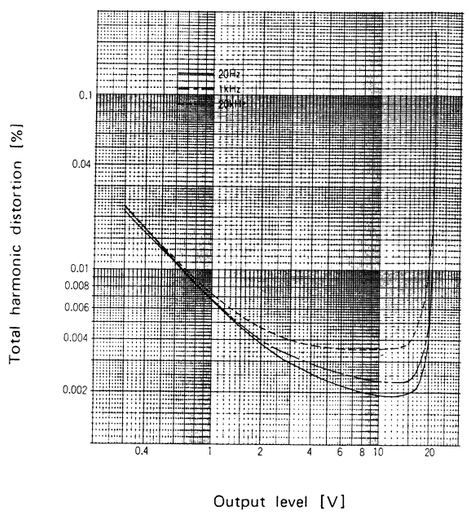
RESPONSE CHARACTERISTICS

Output vs. Total harmonic distortion

PHONO MM → OUTPUT

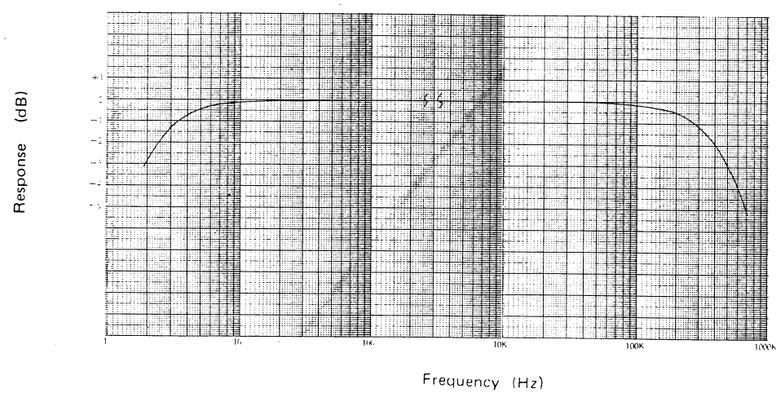


TUNER→OUTPUT

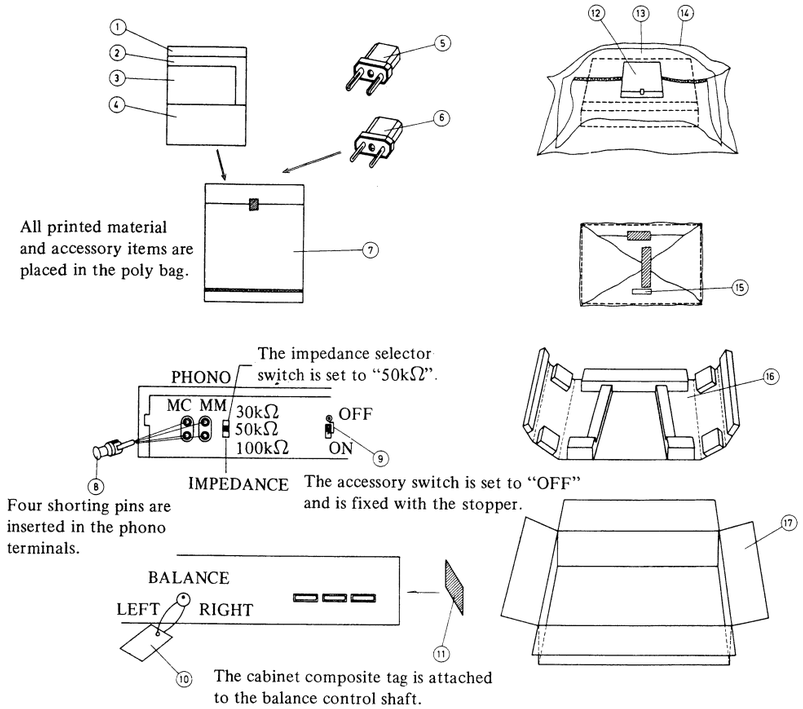


Frequency Response

TUNER → OUTPUT
OUTPUT LOAD:50KΩ



PACKING PROCEDURES


All printed material and accessory items are placed in the poly bag.
The impedance selector switch is set to "50kΩ".
PHONO
MC MM
30kΩ
50kΩ
100kΩ
OFF
ON
IMPEDANCE
Four shorting pins are inserted in the phono terminals.
The accessory switch is set to "OFF" and is fixed with the stopper.
BALANCE
LEFT
RIGHT
The cabinet composite tag is attached to the balance control shaft.

PARTS LIST

REF. NO.	PARTS NO.	DESCRIPTION	U.S.A.	UD	Germany	UG
1	29340232	Instruction Manual				
2	29358001	Service Station List		none	none	none
3	29355046	Caution Card for Warranty Card		none	none	none
4	29365003	Warranty Card		none	none	none
	29365001–1	Warranty Card	none	none		none
5	292005	CV–C, Conversion Plug	none	none		
6	292006	CV–BS, Comversion Plug	none	none	none	
7	29100005	220x330mm, Poly Bag				
8	250153	Shorted Pin				
9	27037–1	Stopper for Accessory Switch				
10	29380031	Cabinet Composite Tag		none	none	none
11	282969	Caution Label A			none	none
12		Accessory Bag Complete				
13	29095012	500x800mm, Protection Sheet				
14	29100019A	550x850mm, Poly Bag				
15	293041	Caution Label			none	none
16	29090180	Pad				
17	29050144	Carton Box				

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